

**WHAT IS CLAIMED IS:**

1. A material system for preparing a mold core used in the fabrication of composite parts comprising:
- a matrix composition for forming the mold core, the matrix composition comprising a water soluble thermoplastic binder selected from the group consisting of polyvinylpyrrolinone, copolymers of polyvinylpyrrolinone, and combinations thereof; and
  - a finishing composition for smoothing an outer surface of the mold core by covering any undesired surface contours or cracks on the outer surface, the finishing composition comprising a water soluble thermoplastic binder and a hardening compound.
2. The material system of claim 1, wherein the matrix composition includes an additive selected from the group consisting of microspheres, hardening compounds, talc, metal particles, polyester fibers, polypropylene fibers, graphite particles, coke particles, compatibilizers, dispersants and combinations thereof.
3. The material system of claim 1, wherein the mold core has a porosity of between about 5 to about 15%.
4. The material system of claim 1, wherein the matrix composition includes about 3% thermoplastic binder, about 79.1% graphite and coke particles, about 0.9% compatibilizer and about 17% water all based on the weight of the composition.
5. The material system of claim 1, wherein the finishing composition includes between about 2 to about 10% water soluble thermoplastic binder based on the weight of the composition and between about 25 to about 50% hardening compound based on the weight of the composition.
6. A composite blend for preparation of tooling materials for fabricating composite parts consisting essentially of:
- polyvinylpyrrolinone, copolymers of polyvinylpyrrolinone, and combinations thereof;
  - and
  - an additive composition for enhancing the functional properties of the blend selected from the group consisting of polymeric microbeads, ceramic microbeads, metallic microbeads, hardening compound, talc, polyester fibers, polypropylene fibers, metallic fillers, ceramic fillers, compatibilizers, dispersants, and combinations thereof.

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7. A method for manufacture of a mold core comprising:
- (a) preparing a core composition having a polymer binder selected from the group consisting of polyvinylpyrrolinone, copolymers of polyvinylpyrrolinone and combinations thereof;
  - (b) depositing the composition in a mold form for shaping the mold core; and
  - (c) drying the mold core to remove residual water.
8. The method of claim 7 further including the step of machining the mold core to provide a mold core having a predetermined shape.
9. The method of claim 7 further including the step of applying a finishing composition to an outer surface of the mold core to provide a smooth surface on the outer surface.
10. The method of claim 7, wherein the finishing composition includes a polymer binder and a hardening compound.
11. The method of claim 10, wherein the finishing composition has a viscosity between about  $10^6$  to about  $10^7$  cP and maintains its positioning on the surface where applied.
12. The method of claim 7 further including the step of forming a composite part on the mold core.
13. The method of claim 12 further including the step of removing the mold core from the composite part by solubilizing the mold core with a solvent.
14. The method of claim 13, wherein the solvent includes water.
15. The method of claim 13, wherein the mold core and composite part are cured before the mold core is removed.
16. The method of claim 15, wherein the mold core and composite part are cured at temperatures of up to at least about 550°F.